

EPIGENETIC REGULATION OF PROTEIN BIOSYNTHESIS  
APPLIED TO FRUITS AND VEGETABLES IN CULTURE: A GARDEN EXPERIMENT

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ABSTRACT

New trials on the effect of the epigenetic regulation of protein biosynthesis, via musical transpositions of the proteic sequences, have been realized in a garden specially created for this purpose.

The experiments displayed quite clearly the effectiveness of the musical transpositions of the proteic sequences. One measures a significance of more than 8 standard deviations with respect to the existence of their effects and 5 standard deviations with respect to their specificity.

They show clearly the economical advantage of such a procedure: In the case of tomatoes for example we measured a twentyfold increase in overall efficiency. Such a result only required the use of six transposed molecules, say 3 minutes of music per day, that we diffused with an usual tape-recorder.

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The experiment that we report here took place in Lacave (Ariege, France) from May to August 1993.

Different vegetables: tomatoes, sweet peppers, carrots, french beans, onions, leeks, courgettes, aubergines, coriander, etc.. of identical extraction had been planted in two different gardens prepared in exactly the same conditions (and by all means subjected to the same sunning conditions).

The first garden served as a control garden. In the second one (denoted the "musical" garden) we diffused, using the speakers of an usual tape-recorder, several sonore sequences. These melodies corresponded to the musical transpositions according to patent n° FR 92 06765 of selected proteins whose specific role within a given vegetable had been beforehand determined.

- Tomatoes were planted between the 19th of May and the 21th of May (delay caused by bad weather conditions). Those in the musical garden received: Thaumatin I (related to the savour), Cytochrome C (energetic metabolism) and tomatoes extensine (growth).

Then from the 18th of July they also received LAT52 (flowering protein) and TAS14 (anti-dryness). During few days we also needed to play the inhibitory of the mosaic virus since some plantations were attacked.

- Radishes (sowed on the 26th of May), beetroots (sowed on the 26th of May), carrots (31th of May) and turnips (2nd of June) received carrots extensin, patatin (for the roots) and Cytochrome C.

- onions (17th of May), leeks (17th of May), herbs of seasoning (24th of May) and french beans (30th of May) received Ferredoxin of spinash, Extensin of tomatoes and cytochrome C.

Results

The differences observed between the plants in the musical and the control garden were flagrant. On the 4th of August the global effect observed for example on tomatoes reached 7,26 standard deviations (The probability of obtaining this result by random is less than  $10 \exp(-12)$ ).

This fact is even more pronounced if we only consider the ten plants which were the closest to the sonore source: 6 standard deviations were measured by the 14th of July and it went up to 8 standard deviations in mid-August.



Tomatoes - July 14th, 1993 - Meter reading Pedro Ferrandiz  
(Thaumatine I + Cytochrome C + Tomato extensins from May 21st on:  
fixed musical source).

Control garden						Musical garden					
Plant N°	H (cm)	Nb tomatoes (<2cm) (>2cm)		flowers	nodes	H (cm)	Nb tomatoes (<2cm) (>2cm)		flowers	nodes	
1	88	5	3	12	12	103	5	6	9	11	-
2	112	14	3	17	14	148	12	9	22	14	*
3	88	5	2	17	12	125	13	14	20	16	*
4	97	7	2	17	13	122	8	9	15	11	*
5	106	6	4	12	15	122	8	11	17	13	*
6	110	5	6	15	13	127	9	8	26	15	*
7	102	10	2	23	13	141	11	10	17	17	*
8	106	9	3	17	13	135	8	9	32	18	*
9	105	7	6	13	12	120	4	5	14	15	-
10	108	9	6	18	14	127	9	8	21	17	-
11	114	8	2	10	14	136	12	7	20	17	-
12	110	5	3	13	13	120	7	5	17	15	-
13	105	4	5	20	12	115	9	6	18	14	-
14	108	9	3	16	13	110	7	7	20	12	-
15	108	10	3	23	12	96	13	1	17	11	-
16	104	8	2	14	13	110	12	6	19	12	-
17	98	6	2	15	12	113	5	4	11	14	-
18	100	8	4	16	12	132	9	4	13	14	*
19	88	13	4	20	9	125	8	11	12	13	*
20	98	9	2	24	12	137	10	10	25	16	*
Tot.		157	67	332			179	150	365		
Mean	103	7.9	3.35	16.6	12.7	123	9.0	7.50	18.3	14.3	
s-d.	±8	±2.6	±1.39	±3.8	±1.2	±13	±2.6	±2.94	±5.3	±2.2	
						-:	115	8.3	5.50	16.6	13.8
							±11	±3.1	±1.86	±3.8	±2.1
						*	131	9.6	9.50	19.9	14.7
							7 ±8	±1.7	±2.42	±6.0	±2.0

Tomatoes of more than 2cm:

CG n°1-10:37 MG:- 55

11-20:30 \* 95

Asterisks (\*) show the 10 'musical garden' plants closest to the sound source (P: the 10 others); plants n°1 to 10 of the control garden were planted 2 days before (interrupted by rain).

With regard to the number of flowers, no measurable difference had been detected on the 14th of July. However as we mentioned before on the 18th of July we started to play the musical transposition of LAT52. Six standard deviations have then been measured on the 4th of August between the number of flowers in the musical and the control garden (the probability for such a variation to occur by chance is less than  $10\exp(-8)$ ). Thus we believe that this example is an other evidence of the specificity of musical effects.

The economical implications of such a procedure seem particularly appealing: musical tomatoes were two to three times more numerous than the control ones (as mentioned above it was depending on the distance to the musical source). To that may be added the fact that musical tomatoes were in average 2.5 times bigger than the control ones.

The transposition of TAS14 (antidryness) has been played on a day basis. During dog days tomatoes from the musical garden needed only two waterings per weeks whereas those from all the neighbouring gardens required a watering every day. All things being considered we obtained for a given quantity of water a production of tomatoes increased by a factor 20 without any use of chimical manure. Finally we mention that musical tomatoes distinguished themselves by a sweeter taste.

Tomatoes - August 4, 1993 - Meter reading Martine Ulmer

(Addition of LAT52 from July 18th on, TAS14 on high temperature days, and inhibition of tomato mosaic virus during a few days; place of the musical source variable)

Control garden				Musical garden			
Plant N°	Nb tomatoes on plant	flowers	tomatoes picked	Nb tomatoes on plant	flowers	tomatoes picked	
1	8	3	1	20	7	1	
2	10	5		29	30		
3	10	15		22	6	2	
4	9	7		22	20		
5	7	5	1	24	25		
6	11	6		24	13		
7	11	13		21	30		
8	11	0		34	33		
9	11	4		17	25	1	
10	14	6		28	35		
11	15	9		13	15		
12	13	12		12	15	1	
13	15	14		17	20		
14	13	12		18	10		
15	16	7		12	20		
16	9	16		17	20		
17	9	9		8	20	2	
18	8	8	1	17	25		
19	10	2		19	10		
20	9	4		25	20		
Tot.	219	157	3	399	399	7	
Mean	11.0±2.5	7.9±4.5		20.0±6.2	20.0±8.2		
				23.9±4.6 (ex-*)			
				16.7±4.9 (ex--)			

Total (Mean± s.d.) 379 (18.9±5.5)

805 (40.2±11.9)

Similar results have been observed on other vegetables. Onions and leeks were 3 to 4 times heavier. Carrots were non either bigger but also sweeter and they exhibited a non expected spicy savour. Musical french beans were also more numerous than in the control garden.

We now report some singular effects which occurred at the end of the first week of August. Necrosies had appeared on the tomatoes nearby the stems and had made us to stop momentarily the musical diffusions: it was likely to come from an overdosage.

Indeed the necrosies quickly disappeared. However when we started the rerun of the music we observed the blooming of double tomatoes.

A similar phenomenon occurred with radish. In this case the music had been momentarily stopped in order to remedy a slog attack (a chemical anti-slog has been used for this purpose). Double radishes then have been also observed after the retaking of the music.

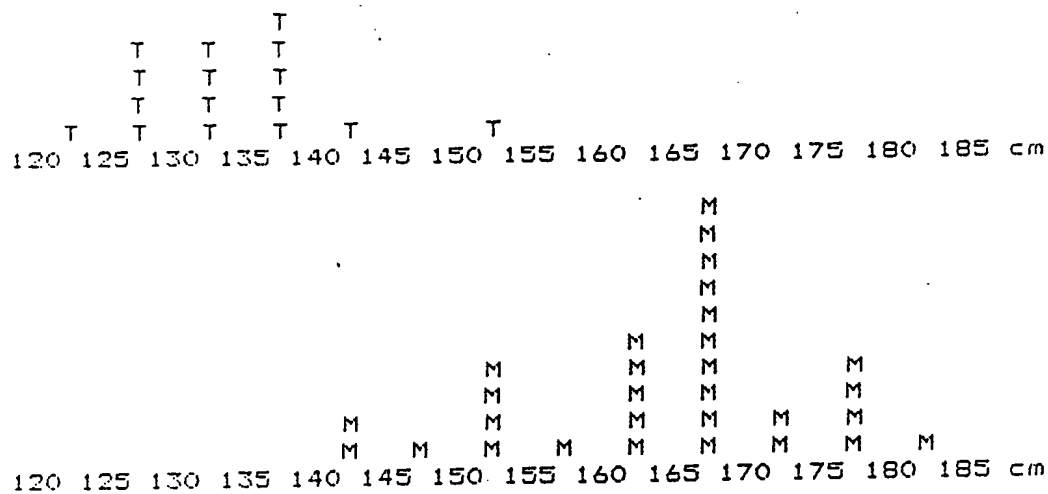
We mentioned earlier that the musical transpositions of the envelope protein for the mosaic virus as well as AL2 have been played in the inhibitory mode. This attempt has successfully neutralised the attacks of the mosaic virus.

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Répartition des plants témoins (T) et musicaux (M) par taille



T = 134,47 +/- 7,35 cm  
M = 164,40 +/- 10,36 cm  
M-T = 29,93 +/- 2,64 cm ( > 11 écarts-types).

